REMARKS

Claims 1-6, 29-35, 38-41, 43, and 44 are pending. Claims 29-35, 38-41, 43, and 44 stand rejected. Claims 29, 35, 38-39, 41, 43, and 44 are being amended. New Claims 45-47 are being added. Support for the new claims may be found in the Application, as originally filed, at least on page 34, lines 19-21.

Rejections Under 35 U.S.C. §112 and Claim Objections

Claims 29-35, 38-41, and 43-44 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite. Claims 29, 35, 38-39, 41, 43, and 44 are being amended, in the Claim Listing above, to clarify the language of these claims. Accordingly, the objections and rejections of Claims 29, 35, 38-39, 41, 43, and 44 under 35 U.S.C. §112, second paragraph, are believed to be overcome.

Rejections Under 35 U.S.C. §101

Claims 41, 43, and 44 were rejected under 35 U.S.C. §101 for being directed to a non-statutory subject matter.

Claims 41, 43, and 44 are being amended to include the term "in a processor." Support for this amendment may be found in the Application, as originally filed, at least on page 37, lines 10-11. Accordingly, Applicants respectfully submit that Claims 41, 43, and 44 meet requirements of 35 U.S.C. §101 by being tied to a particular system (*i.e.*, a processor, which is known in the art to be a physical and tangible machine), and, therefore, are statutory subject matter under 35 U.S.C. §101.

Moreover, the U.S. Supreme Court in *Bilski et al. v. Kappos, No. 08-964* opined on June 28, 2010 that the machine-or-transformation test is not the exclusive test for determining patentable subject matter. Accordingly, the excluded categories for patentability are now limited to laws of nature, physical phenomena, and abstract ideas. The subject matter recited in Applicants' Claims 41, 43, and 44 provides useful, concrete, and tangible results (*e.g.*, reducing interference, allocating bandwidth, etc.) and clearly does not fall under these excluded categories.

Accordingly, Applicants respectfully submit that the rejection of Claims 41, 43, and 44 under 35 U.S.C. §101 are overcome. Withdrawal of the rejections is respectfully requested.

Claim Rejections Under 35 U.S.C. § 103

Claims 38 was rejected under 35 U.S.C. §103(a) as being anticipated by Paulraj *et al.* (U.S. Patent No. 5,345,599, hereinafter referenced as "Paulraj") in view of Shattil *et al.* (U.S. Patent No. 6,008,760, hereinafter referred to as "Shattil").

Claim 38 is now amended. Support for the amendments may be found in the Application, as originally filed, at least on page 36, lines 14-23.

Claim 38, as currently amended, recites (emphasis added):

> A signal receiver for receiving communications signals, the signal receiver comprising:
>
> an adaptive array configured to receive signals from remote units;
>
> a plurality of demodulator units configured to process the signals received;
>
> ***a plurality of beamformers configured to construct a desired signal response pattern as a function of direction of arrival data of the signals received, the desired signal response pattern having an angular radius indicative of relative gain of the desired signal in a given angular direction;***
>
> ***a base station configured to modify the desired response pattern to provide a higher relative gain of the desired signal in one or more angular directions and minimize co-channel interference in other angular directions;*** and
>
> a spatial diversity combiner configured to remove interference from the received signals.

Paulraj relates to a receiving station that includes *m* receiver front-end outputs that are input to a spatial filter. The spatial filter employs the *m* signals to estimate *d* separate impinging signals. The *d* spatial filter outputs signals that are processed by a *d*-channel demodulator and decoder that demodulates the signals to obtain digital data streams and decodes the data streams to generate the *d* sub-streams. The demodulator outputs are then combined. The combiner is "simply a d-way multiplexer" (see column 8, lines 11-49 and shown in Figs. 5 and 6 of Paulraj) that receives the demodulator/decoder signals, aligns the signals to compensate for differential delays experienced by the signals, and combines the time aligned signals to obtain an estimated source stream.

Paulraj may employ the direction of arrival information to separate co-channel signals into individual signals prior to feeding them into the demodulators. However, in contrast to Applicants' Claim 38, Paulraj neither employs the direction of arrival information to "construct a desired signal response pattern" nor includes a base station that is "configured to modify the desired response pattern to provide a higher relative gain of the desired signal in one or more angular directions and minimize co-channel interference in other angular directions."

The present Office Action acknowledges that Paulraj fails to teach having receiving elements "construct a desired signal response pattern as a function of direction of arrival data of the signals, ..., provide a higher relative gain of the desired signal in one or more angular directions and minimize co-channel interference in other angular directions" and combines Shattil with Paulraj to remedy these deficiencies of Paulraj.

Shattil describes an interferometric beam shaping technique that combines multiple antenna beam patterns "to provide cancellation in predetermined directions without reducing the magnitude of the main beam" (column 2, lines 62-65). Specifically, Shattil employs an antenna array 100 that employs two antennas 101, 102 coupled to an interferometric beam-narrowing processor 303 that is, in turn, coupled a receiver output 313. Shattil assumes that two spatially distant radio frequency sources 91, 92 transmit first 151 and second 152 radiation beams that are incident at the antennas at incident angles θ_1 and θ_2, respectively (see column 4, lines 14-64). The radiations received by the antennas are processed by the processor 303 and output by the receiver output 313 as signals S_{C1} and S_{C2}. The signal S_{C1} is then delayed by a value D_4 and adjusted in magnitude by a scalar weight factor *g* in a weighting element 351. The value of D_4 is an amount required to match the phases of the contributions of the second source to S_{C1} and S_{C2}. The magnitude adjusted signal S_{C1} is subtracted from signal S_{C2} to provide a composite signal S_{C3} (see column 6, lines 11-15). The composite signal is represented by an interferometric beam pattern that has a null in a direction θ_2 (see Shattil's Figs. 1-2 and column 5, lines 59-65), is narrower than the first radiation beam 151, "***but has the same peak magnitude as the first radiation beam 151***" (emphasis added, see column 6, lines 27-28). Further, in order to deal with possible signal interference, Shattil employs complex weights to null certain frequency components of interfering signals. If the interfering signal has a significant bandwidth and if the signal arrives from some angle other than broadside, the array 100 employs several closely

spaced nulls to null all frequency components simultaneously. Since the antenna array 100 may have multiple reception patterns corresponding to multiple signal frequencies, Shattil achieves control of the radiation pattern by relative positioning of the elements and the relative electrical excitations of the individual array elements (column 6, lines 57-60).

Therefore, Shattil merely processes signals received by multiple antenna elements and provides cancellation in multiple directions to ensure that a resulting composite signal has the same peak magnitude as its originating radiation beam. Shattil neither "provide[s] a higher relative gain of the desired signal in one or more angular directions [nor] minimize[s] co-channel interference in other angular directions," as required by Applicants' Claim 38. Further, although Shattil teaches controlling the relative positioning of antenna elements to control radiation pattern, Shattil does not employ "direction of arrival information" and offers no suggestion of "construct[ing] a desired signal response pattern as a function of direction of arrival data of the signals received," as required by Applicants' Claim 38, as amended. In fact, by arranging the interferometric beam pattern 153 to have "the same peak magnitude" as the first main beam 151, Shattil uses a different principle of operation from Applicants' Claim 38, which requires modifying the "desired response pattern to provide a higher relative gain of the desired signal in one or more angular directions."

A hypothetical system combining the teachings of Paulraj and Shattil may include multiple antennas, but it would neither include a "plurality of beamformers configured to construct a desired signal response pattern as a function of direction of arrival data of the signals received, nor would the hypothetical system have "a base station configured to modify the desired response pattern to provide a higher relative gain of the desired signal in one or more angular directions and minimize co-channel interference in other angular directions."

One of ordinary skill in the art would not be motivated to modify the hypothetical system to arrive at Applicants' Claim 38, because such modification requires significant modification of the hypothetical system and would only be done in hindsight of Applicants' teachings. Specifically, since Shattil requires having a beam with "the same peak magnitude" as the first main beam, one would have to alter fundamental principles of operation of the hypothetical system to produce a beam pattern having a higher magnitude than the original beam. Further, since the hypothetical system requires merely controlling the radiation pattern based on relative

positioning of the elements, one would need to modify the hypothetical system to instead construct the desired signal pattern and satisfy the requirements of Applicants Claim 38. Such modification clearly would require substantial alteration of the hypothetical system, effectively altering its fundamental principles of operation (*e.g.*, increasing a peak magnitude vs. keeping it the same and controlling a signal vs. constructing a desired signal having certain requirements), and would only be done in hindsight of Applicants' teachings.

Accordingly, Applicants respectfully request that the rejection of Claim 38 under 35 U.S.C. § 103(a) be withdrawn.

Claim 39 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paulraj in view of Shattil in further view of Forssen *et al.* (U.S. Patent No. 5,566,209, hereinafter referred to as "Forssen").

Forssen merely employs direction of arrival data in combination with factors, such as weighting and minimization of an error signals, to enhance a training sequence used as a desired signal. Foressen's combiner neither constructs "a desired signal response as a function of direction of arrival data of the signals received" nor requires the combined signal to include a pattern that has "a higher relative gain in one or more angular directions and minimizing co-channel interference in other angular directions," as required by Applicants' amended Claim 38.

Rejected Claim 39 depends from base Claim 38. As explained above, Paulraj and Shattil do not teach all of the elements recited in base Claim 38. These limitations of Paulraj and Shattil are not cured by Forssen. Therefore, without discussing or acquiescing to the merits of the reasons for rejecting this claim, it is Applicants' position that this claim is allowable over Paulraj and Shattil alone or in view of Forssen. Accordingly, Applicants respectfully request that the rejection of Claim 39 under 35 U.S.C. § 103(a) be withdrawn.

Claim 40 was rejected under 35 U.S.C. §103(a) as being anticipated by Paulraj in view of Forssen and further in view of Alamouti *et al.* (U.S. Patent No. 5,933,421, hereinafter referenced as "Alamouti").

Alamouti is being combined with Paulraj and Foressen because these references do not teach employing OFDM. However, as described above, these references do not teach requisite elements of Applicants' Claim 38, from which Claim 40 depends.

These shortcomings of Paulraj and Foressen with respect to Applicants' claims, as amended, are not cured by the OFDM system of Alamouti. Therefore, without discussing or acquiescing to the merits of the reasons for rejecting this claim, it is Applicants' position that this claim is allowable over Paulraj and Foressen alone or in view of Alamouti. Accordingly, Applicants respectfully request that the rejection of Claim 40 under 35 U.S.C. § 103(a) be withdrawn.

New Claims 45-47

Claims 45-47 refine the element processor to being "a base station" for each of independent Claims 41, 43, and 44, respectively. Accordingly, these claims are believed to be allowable for at least the same reasons as their base claims.

Allowable Subject Matter

Applicants note with appreciation the allowance of Claims 1-6.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims that will be pending after the entry of this amendment, Claims 1-6, 29-35, 38-41, 43, and 44-47, are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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